

Hat Part From Plastic Material

The present invention is related to a hat part, a hat flap or a visor cap in particular, made from a plastic material.

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From the German utility model G 19 26 448, a protective hood with a bonnet visor, consisting of plastic material, is known. The bonnet visor is made in one piece with a forehead sweat ribbon and a forehead portion. The forehead portion is angled at 90° with respect to the horizontal part of the bonnet visor.

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From DE 31 00 095, a hat with an interchangeable flap portion is known. Hat and flap portion are connected to each other by means of a pressure-sensitive adhesive tape, so that the flap portion is detachably connected with the hat.

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From DE 1 946 478, a bonnet visor made from plastic material is known, in which a vertically angled forehead portion is attached to a visor portion. Visor portion and forehead portion are made in one piece of acrylonitrile-butadien-styrene in the plastic injection moulding method.

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From US 5 131 094, a sun visor is known, which can be worn like a frontlet. The sun visor consists of a visor portion and a forehead portion, which is realised in one piece with the visor portion.

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From US 2 057 915, a fabric cap is known, the visor of which is made of a thick, heavy canvas.

From US 1 964 919, a visor cap is known, the visor of which is made of a rigid material.

From US 6 138 279, a visor cap is known, in which a visor insert is covered on both sides with a fabric material. The visor insert is made from a plastic material which constantly maintains that form which was established during the manufacturing operation.

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The present invention is based on the objective to provide a hat part which can be adapted to a desired form by the user without difficulty.

According to the invention, the objective is resolved by a hat part with the features
10 of patent claim 1. Advantageous forms of realisation are the subject matter of the subclaims, the transportation container according to claim 13 being provided for the transportation of hats, caps, bonnets and the like which are provided with a hat part according to the present invention.

15 The hat part according to the present invention is made from a plastic material, which has a reversible shape memory and which maintains its shape below a first temperature and is deformable above that temperature. The plastic material has a softening temperature of from 60°C to 140°C. Above the softening temperature, the material becomes soft and can be deliberately formed by hand. When the material is
20 then cooled again, it remains in the formed shape and maintains it until it is heated again. The softening temperature permits nondestructive deformation and adaptation of the hat part to the needs and wishes of the user. Such plastic materials are also denoted as reversibly thermoplastic materials. The advantage of using such plastic materials for parts of hats, caps or other head coverings is that the person bearing the
25 hat can adapt this part quite selectively onto his/her needs. For the person bearing the hat, there is the possibility to heat the hat part, to bring it into the desired shape and to cool it in the desired shape consecutively. This procedure can be repeated without damage of the material.

As such a plastic material, a thermoplastic polyurethane, which is based on polyether or polyester, is preferably used. Thermoplastic urethane materials have proven to be particularly advantageous, just in view of the processability and of the fastness of the plastic material. In particular, these materials have also good impact-
5 and tear resistance, so that they may be also applied without any danger for the user in sport caps, for instance. Also, it has been found that an impact strength is present up to -60°C with thermoplastic urethanes, so that breaking of the hat part does not take place even at very low temperatures. Furthermore, thermoplastic urethanes are normally odour-free and recyclable.

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A hat flap is preferably provided as the hat part, which has a portion resting against the head of a person bearing the hat and a portion distant thereof, the hat material being attached to the resting portion.

15 In this, the person bearing the hat can newly define the shape of the portion resting on the head by heating, as well as the position of the flap can be newly formed by heating.

20 In a further form of realisation, which proves to be very advantageous, a visor part for a cap with visor is provided as the hat part. In the following, each kind of bonnet and/or cap provided with a visor is to be understood as a visor cap, sport caps in particular, like baseball caps and the like, for instance. As the hat part, a protective sighting screen with or without shading may also be provided.

25 Preferably, the plastic material is partly or completely metallised. In order to obtain special optical effects, coloured foils can be injected into the plastic material completely or partly, imprinted foils are also designated as so-called in mould labels (IML). Also, special effects can be achieved in the hat part by incorporating pigments, namely in particular dye pigments, effect pigments, phosphorescing

and/or fluorescing pigments, metallic and/or glittering pigments and Irodin®-pigments. Furthermore, an UV absorbing material for UV-A, UV-B and/or UV-C may be provided, so that protection according to UV400 is also obtained.

- 5 In a preferred form of realisation, the plastic material is realised as being partially or completely transparent. A very particular effect is achieved in the plastic material by injection moulding it. In contrast to known hat parts from plastic materials, injection moulding permits the production of hat parts with a particular thickness. The thickness can be 0,2 mm up to 20 mm, for instance. Also, it is possible to produce
- 10 the hat part in a varying thickness, through which particular optical and aesthetic effects are generated. The realisation with varying thicknesses and wall cheeks permits to give the hat part a certain basic shape, which limits the deformation of the plastic material in the softened state.
- 15 For the practical application, it has proven to be advantageous that the plastic material is flexible and/or elastic even below the first temperature, so that breaking or other destruction of the hat part is not possible.

In practical tests it was found that a plastic material with a VICAT-softening 20 temperature, in particular the softening temperature for VICAT A with 50 N, of from 60°C to 140°C, preferably from 70°C to 95°C, is particularly suitable. Just with these temperatures, it was revealed that they can be easily obtained by a water bath, so that the user can newly define the shape without that change of the shape takes place in the normal use.

- 25 Also, it has come out for practical use that that a plastic material with a heat deflection temperature, in particular at a bending stress of 0,45 MPa, in the range between 50°C and 170°C, preferably between 62°C and 101°C, has particular advantages.

After their production, the described hat parts are transported to a bonnet-maker or hat-maker, respectively, which provides the hat part with a hood part. The thus completed head cover is again transported hereafter. In the use of the above-5 described thermoplastic material, it has proven to be advantageous to use a transportation container with at least one accommodation compartment, into which at least one hat part is inserted and rests completely or partially against the inner side of the walls in the inserted state. Thus, the hat part is kept in its desired shape by the walls.

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Preferably, the accommodation compartments are realised so as to accommodate visor parts, the visor parts being put into the accommodation compartments. In a preferred form of realisation, more than one visor part is put into the accommodation compartment, preferably, three visor parts are disposed in the accommodation 15 compartment.

Preferably, the accommodation compartments run in a fashion to be disposed parallel to each other, and two accommodation compartments are separated from each other by a common dividing wall. Preferably, the transportation container is 20 made from a foamed material, from Styropor® in particular.

In an alternative form of realisation, the accommodation compartments are formed by groove pairs facing each other, which keep the hat parts to be accommodated, the visor parts in particular, in the desired position.

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Preferred examples of realisation of hat parts from thermoplastic materials are explained in more detail by means of the following examples.

Fig. 1 shows a front view of a visor cap,

Fig. 2 shows a frontlet with visor part,

Fig. 3 shows a hat with flap- and hood portion

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Fig. 4a and 4b show a flap part in two different configurations,

Fig. 5 shows a transportation container with accommodation slits,

10 Fig. 6 shows a transportation container with accommodation slits for three visors

Fig. 7 shows a transportation container with parallel accommodation grooves.

15 Fig. 1 shows a visor cap 10 with a hood portion 12 and a transparent visor 14. The hood portion 12 may be provided with a locking unit on its (not shown) rear side, in order to adapt the hood portion to different head sizes.

20 The visor part 14 is made from a thermoplastic polyurethane elastomer which is based on polyester or polyether. This material is elastic and flexible. It can be reversibly deformed, so that the visor cap 14 is apt to be adaptable in its form according to the desire of the person bearing it. Polyurethane elastomers have excellent impact- and tear resistance, respectively, as well as a sufficient low temperature flexibility and low temperature impact tenacity down to -60°C. Thus, such a cap can be used even in extreme weather conditions, without that there is any 25 danger that the visor may become brittle or fragile.

The visor part 14 is preferably made from a transparent plastic material. The card-transparent plastic material is dyed with a dye, so that the translucent light is coloured.

Fig. 2 shows a frontlet 16, which is provided with a visor 18. Like in the cap shown in Fig. 1, even here again the visor can be preferably made from a thermoplastic polyurethane elastomer. In order to achieve the thickness of from 1 to 8 mm which 5 is typical for visors, it has proven to be advantageous to produce the visor parts with the injection moulding method.

Fig. 3 shows a conventional hat 20, which is assembled separately from a flap part 22 and a hat part 24. Hat part 24 and flap part 24 may be bound to each other via a 10 Velcro fastener 26, for instance, as is shown in the figure. However, it is also possible to sew up or glue up flap part and hat part together.

Fig. 4a and 4b show the flap part 24 in two different configurations. The configuration in Fig. 4a shows the neck portion of the flap in an upside revolved 15 position, whereas Fig. 4b shows the corresponding portion of the flap when revolved to the downside. In order to bring the flap from the configuration in Fig. 4a to the configuration in Fig. 4b, it is necessary to heat up the flap part. When the corresponding temperature is exceeded, the flap part can be brought into the corresponding configurations.

20 Fig. 5 shows a transportation container 28 with three rows of accommodation compartments for visor parts 14 and 18, respectively. The visor parts are put into the compartment 30 in a condition when they are still warm, where they take up their predetermined shape upon cooling down. In the transportation container 28, the 25 visor parts are then transported to the bonnet maker, which bonds the visor part to the corresponding cap. The upper side of the accommodation compartments is convexely curved 32, so that the visor part can be transported further together with the cap part after manufacturing. Even in this it is ensured that the visor part is not deformed by the transportation. The transportation container is shown with three

rows of accommodation compartments; however, it may also have 1, 2 or more rows.

The thermoplastic polyether-polyurethane of the company Elastogran GmbH of the 5 1100 series has proven to be a particularly suitable plastic material. In particular, Elastollan 1174 D, which is suited for injection moulding, with the following properties has proven to be particularly advantageous.

Property	Dimension	DIN	ISO	1174 D
Suited for injection moulding ▲ extrusion ■ blow forming •				▲
Hardness	Shore A	53505	868	
Hardness	Shore D	53505	868	73
Density	g/cm ³	53479	1183	1,20
Tensile strength	MPa	53504	37	50
Elongation at break	%	53504	37	300
Tension at 20% elongation	MPa	53504	37	25
Tension at 100% elongation	MPa	53504	37	30
Tension at 300% elongation	MPa	53504	37	45
E-module from tensile strength test	MPa	DIN EN ISO 527		560
Tear strength	N/mm	53515	34	220
Wear	mm ³	53516	4649	220
Compression set at room temperature	%	53517	815	50
Compression set at 70°C	%	53517	815	55
Tensile strength after 42 days storage in water of 80°C	MPa	53504	37	35
Elongation at break after 42 days storage in water of 80°C	%	53504	37	400
Impact strength (Charpy)	+23°C -30°C	KJ/m ²	53453	No break 6

10 On a polyester basis, the following thermoplastic polyester-polyurethane of the 600 series has been proven to be particularly suited:

Property	Dimension	DIN	ISO	1174 D
Suited for injection moulding ▲ extrusion ■				▲
Hardness	Shore A	53505	868	
Hardness	Shore D	53505	868	60
Density	g/cm ³	53479	1183	1,23
Tensile strength	MPa	53504	37	55
Elongation at break	%	53504	37	450
Tension at 20% elongation	MPa	53504	37	8
Tension at 100% elongation	MPa	53504	37	14
Tear strength	N/mm	53515	34	140
Wear	mm ³	53516	4649	35
Compression set at room temperature	%	53517	815	30
Compression set at 70°C	%	53517	815	40
Tensile strength after 42 days storage in water of 80°C	MPa	53504	37	40
Elongation at break after 42 days storage in water of 80°C	%	53504	37	500

The deformation behaviour of the plastic materials under heat is described by defined technical tests. The VICAT-softening temperature (VST) according to ISO 306 and the determination of the heat deflection temperature (HDT) according to 5 ISO 75 belong to these tests. In the testing of the VICAT-softening temperature, the material is loaded with a needle, which has a round cross sectional area of 1 mm². The material to be tested is located on a planar support in a temperature transfer medium, like oil or air, e.g. The medium is heated up with a constant heating rate of 50 K/h or 120 K/h. The VICAT-temperature is that temperature at which the needle 10 penetrates the material to be tested for 1 mm. In other words, the VICAT-softening temperature describes from which temperature on the plastic material has reached a certain softness. In doing so, it is distinguished between the so-called VICAT A test and the VICAT B test, the needle being loaded with 50 N in VICAT A and with 10 N in VICAT B.

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The preferred plastic materials have a VICAT-temperature at 50 N of from 82 to 85°C. However, plastic materials having a VICAT-temperature between 60°C and 140°C can also be used.

Similar to the VICAT test, in the heat deflection test the material to be tested is heated in a heat transfer medium with 50 K/h or 120 K/h. The arrangement is carried out via a 3-point bending test, wherein the sample is strained with a constant load, 5 which is 0,45 MPa, 1,80 MPa or 8 MPa, according to the method applied. The temperature at which a rod is bent about 0,2 to 0,3 mm is indicated as the HDT. For the preferred materials, the HDT is in a range of 50°C to 170°C at a bending pressure of 0,45 MPa.

10 Fig. 6 shows a further form of realisation of a transportation container 34, in which accommodation slits 36 are arranged parallel to each other. The slits 36 are arranged parallel to each other along a row. The bottom 38 has a larger thickness than the side walls 40. The transition from the bottom 30 to the side wall 40 is curved such that a convex bottom area 42 is generated in the container. The width of the slits 36 can be 15 realised such that either one or several cap visors can be inserted therein for transportation.

Fig. 7 shows a further form of realisation of a transportation container 44, which has essentially a U-shape with two side walls 46 and 48 arranged parallel to each other 20 and a bottom plate 50, which is provided at right angle between them. For the sake of material saving with respect to the realisation from Fig. 6, the thicknesses of the side walls 46, 48 and that of the bottom plate 50 are essentially equal. A pair of grooves 52, 54 is worked into the side walls, which are connected with each other by a groove 56 in the bottom plate. The grooves 52, 54, 56 can have a width which is 25 provided for the accommodation of one cap visor or for the insertion of several cap visors. The accommodation 36, as well as the grooves 52 to 56 are arranged such that the inserted cap visor is kept in its predetermined curvature. Hence, after the injection moulding of the cap visor it can be put into the transportation container, where it solidifies to its predetermined shape.